

Name: \_\_\_\_\_

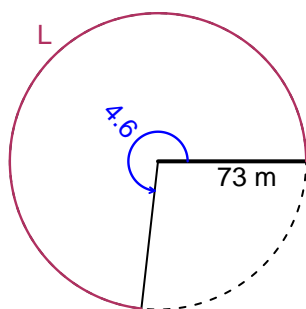
Date: \_\_\_\_\_

## Trig Final (Solution v18)

- You can use a calculator (like [Desmos](#))
- You should have a unit-circle with special angles and coordinates marked.

### Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 4.6 radians. The radius is 73 meters. How long is the arc in meters?

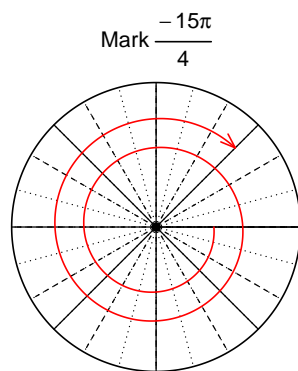


$$\theta = \frac{L}{r} \quad r = \frac{L}{\theta} \quad L = r\theta$$

$L = 335.8$  meters.

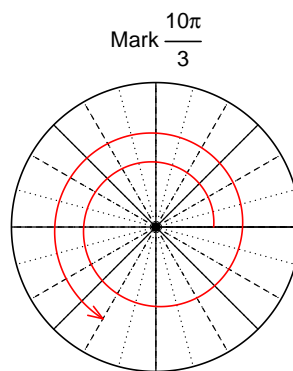
### Question 2

Consider angles  $-\frac{15\pi}{4}$  and  $\frac{10\pi}{3}$ . For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for  $\cos\left(-\frac{15\pi}{4}\right)$  and  $\sin\left(\frac{10\pi}{3}\right)$  by using a unit circle (provided separately).



Find  $\cos(-15\pi/4)$

$$\cos(-15\pi/4) = \frac{\sqrt{2}}{2}$$



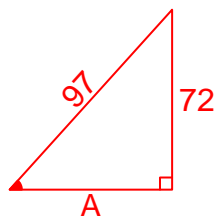
Find  $\sin(10\pi/3)$

$$\sin(10\pi/3) = \frac{-\sqrt{3}}{2}$$

### Question 3

If  $\sin(\theta) = \frac{-72}{97}$ , and  $\theta$  is in quadrant III, determine an exact value for  $\tan(\theta)$ .

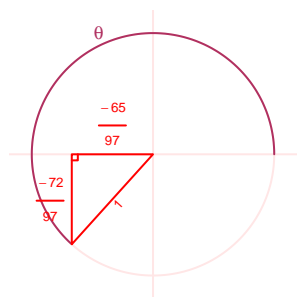
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$\begin{aligned}A^2 + 72^2 &= 97^2 \\A &= \sqrt{97^2 - 72^2} \\A &= 65\end{aligned}$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\tan(\theta) = \frac{\frac{-72}{97}}{\frac{-65}{97}} = \frac{72}{65}$$

### Question 4

A mass-spring system oscillates vertically with a frequency of 4.8 Hz, a midline at  $y = -8.57$  meters, and an amplitude of 7.37 meters. At  $t = 0$ , the mass is at the midline and moving up. Write an equation to model the height ( $y$  in meters) as a function of time ( $t$  in seconds).

Any of these equations would get full credit.

$$y = 7.37 \sin(2\pi 4.8t) - 8.57$$

or

$$y = 7.37 \sin(9.6\pi t) - 8.57$$

or

$$y = 7.37 \sin(30.16t) - 8.57$$